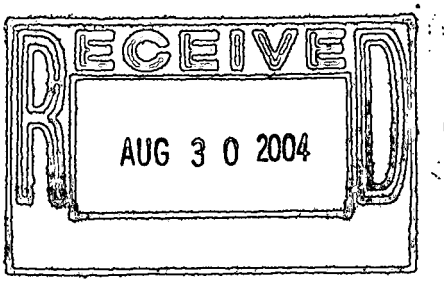
Rocky Flats Environmental Technology Site: Actinide Migration Evaluation
Meetings: June 7-9, 2004
Advisory Group: Greg Choppin, David Clark, David Janecky, Leonard Lane

Summary and Recommendations for Path Forward

As contract completion draws closer, it will be more important to make the best decisions and implement them to avoid re-doing work and raising questions as to the technical basis of the decisions and actions taken. Accomplishing these goals requires utilizing Site databases, modeling results, expertise, and documenting these in plans and reports. Buildings 444 and 771, pond reconfiguration evaluation, long-term monitoring, and evaluation are key areas for attention at this time. Understanding and documenting discontinuities between building, soil, and surface water contamination limits. Implications to remediation activities remains a critical factor in achieving closure and environmental protection. As contaminated areas are remediated to required standards and criteria, it is important to document the rationale and analytical basis for inclusion/exclusion of hot spots. Comprehensive evaluations and decisions regarding remediation and reconfiguration often include selecting an action from a suite of alternatives (*e.g.,* pond reconfiguration study). We recommend that the path forward in selecting the best alternative remediation/management plan from among alternatives should continue to emphasize a multi-objective approach that involves peer review, stakeholder participation, and public review. Integration techniques need to be continued and documented in plans and reports.

Progress and Integration

The AME Advisors were pleased to see the continued level of progress in integrating databases, modeling, Site personnel expertise, and knowledge, in analysis of remediation/Site configuration projects, and proposed alternatives. Furthermore, the Advisors are pleased to see the "value" being added to these analyses, decision processes, and remediation activities by adoption of adaptive management techniques (*e.g.,* 903 Pad dust suppression, lip area erosion control by installation of erosion control blankets) and by adoption of multi-objective analyses and decisions (*e.g.,* uranium contamination and building D&D).



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Results and Discussions

Building 444 plans

Frank Gibbs discussed the current status of Building 444. He pointed out that the B444 complex dismantlement is nearing completion, and decontamination through mechanical means has begun. There is depleted uranium contamination. The amount of contamination is much lower than expected, and it is estimated to be somewhere between 3-5 times above the free-release criteria for depleted uranium. Frank expressed concern over worker safety and was interested in the AME Advisor perspective on whether this small amount of uranium contamination could be left in place. The map of contamination for the building 444 basement, that was provided to the Advisors, was a swipe survey drawing showing the individual survey points. We saw no other documentation of uranium contamination or the building 444 decision-making processes to assist us in reaching an informed position. The overall decision should be based on a number of factors, including (i) an accurate assessment of the level of uranium contamination; (ii) the known geochemical behavior of uranium; (iii) the surface and groundwater flow paths; (iv) modeling results to assess the potential of the uranium to impact surface water standards; and (v) the amount of effort and worker risks required to decontaminate the concrete surfaces. In view of what the Advisors know about current activities and were provided as documentation, it would appear that the Site has the necessary experience base to accomplish the bulk of the uranium decontamination. Uranium contamination in locations that pose a significant risk to worker safety (such as plenums, *etc.*) could likely be left behind with little impact to surface water quality. This should be specifically documented and evaluated to demonstrate maximum potential impacts to human health and the environment.

Plans – remaining buildings (771, 371)

Chris Gilbreath discussed the progress in decontaminating Building 771. A short history of the building was presented, and then discussion of cleanup strategy above and below the demarcation that represents "6-ft below grade". Multiple passes of Hydrolasing have essentially removed contaminated concrete down to rebar in some areas. It appears that Hydrolasing technology will allow the Site to meet the surface and volumetric contamination standards. Chris also discussed worker safety issues associated with using Hydrolasing, and the Advisors are very impressed with both the remarkable safety record and notable commitment by the Site to take on decontamination of this building with such a "can do" attitude. As with Building 444, the Advisors would like to see a RFCA documentation, and have requested that this documentation be provided to the Advisors. The Advisors learned that Building 371 will likely employ a dry decontamination methodology that will reduce waste during decontamination.

Recent surface water monitoring results

George Squibb, URS, presented results and interpretations of recent surface water monitoring results including flow rates and volumes, sediment concentrations, and actinide concentrations at RFETS and recent surface water monitoring for the RFCRA Point of Compliance at gauging station GS01.

Gauging station GS10 (hereafter just GS10) is a Point of Evaluation Station (POE) and is currently (from samples taken from November 2003 through April 26, 2004) showing reportable 30-day averages for both Pu and Am. Reportable actinide concentrations are equal to, or greater than, 0.15 pCi/L based on the 30-day average. Additional sample data from April 26 through May 13, 2004 are pending. These pending data will be used to help determine if the elevated concentrations represent an isolated "spike" or a longer trend. Likely sources of these increased Pu and Am loads are the Solar Ponds area and the 903 Pad Area. These source area determinations are based on the relative loads contributed by gauging stations within the GS10 watershed

The SW093 gauging station is a POE and is currently (from samples taken from April 11 through April 26, 2004) showing reportable 30-day average concentrations for both Pu and Am. Additional sample data from April 26 through May 24, 2004 are pending. These pending data will be used to help determine if the elevated concentrations represent an isolated "spike" or a longer trend. Likely sources of these increased Pu and Am loads include: the Solar Ponds/B779 areas, B771 and B776 areas, and, perhaps a newly exposed Pu source area within the SW093 watershed. Similarly to GS10, these areas are likely source areas because of monitoring results at gauging stations within the SW097 watersheds indicating the interior points where the highest Pu and Am concentrations were monitored.

The GS01 station is located on Woman Creek at Indiana Avenue and is a Point of Compliance (POC). Between January 22 and the end of February 2004, Pu and Am concentrations were elevated above concentration data taken from January 1through 22 and March 1 through April 20. This produced a spike in the 30-day volume weighted moving average concentration between January and April that approached the 0.15 pCi/L standard. The "up and down" character of the concentration data at GS01 appear to represent a spike, however, subsequent data through time will be required to test this hypothesis.

Future pond operations and potential impacts on surface water quality

John Stover of DOE introduced the present plan for remediation of the A-, B- and C-series ponds, which has a goal of contamination less than 50 pCi/g at surface of sediments. The concerns with regard to water quality (*e.g.*, resuspension of contaminants) and habitat impacts (*e.g.,* evaporative and pond discharges) were reviewed briefly. More frequent discharges are proposed to reduce evaporative losses and increase water in downstream habitats.

The ponds are expected to be reconfigured to remove early ponds from future flow paths. These ponds will be stabilized and contaminated sediment removed. Ponds A-3, A-4, B-5, and C-2 would continue in use with passive control to maintain water quality. If needed, they would be upgraded to be in the desirable operational mode prior to initiation of stewardship.

This was a useful talk as the goals for each step in the planned changes was described and the operations goals were justified.

Site tour, including sites of bldg 991, 881, 903 Lip Area, and ponds

A Site Tour, including buildings 991, 881, 903 Lip Area, and Ponds was conducted by Ian Paton (WWE and AME Group) and George Squibb (URS) on April 7, 2004. This tour illustrated the striking degree of progress made at the Site since our last tour during February 2004. This is perhaps the most useful and informative tour we have had in several years.

For example, we observed and discussed the operations and soil erosion control measures being taken in the 903 Pad Lip Area. An example of this area is illustrated in Figure 1. Notice the staked and delineated improved road (uncontaminated base coarse) controlling the driving area of the vehicles, the erosion control mats, and emerging vegetation. Taken together, these and other, features are key operational and remedial erosion control measures. Our discussions at this site emphasized the improved remediation actions, which include erosion control measures at the contaminant source area and the fact that the remedial erosion control actions (*e.g.*, the erosion control matting) are emplaced as soon as possible after the disturbance to the soil surface. These "source area controls" and "immediate emplacement" actions are critical to effective erosion (and thus actinide transport control).

In contrast with the improved erosion control measures seen at the 903 Pad Lip Area, the situation at the Solar Ponds area was quite different (Figure 2). Notice the storage bins and evidence of vehicle traffic, which has destroyed the heavy vegetation cover in the Solar Ponds area. These practices leave large areas of bare, exposed soil subject to high soil erosion rates from wind and water. Also, notice the soil spoil pile of unknown origin and of unknown contaminant concentration. This too presents an exposed sediment and potential contaminant source area. The conditions illustrated in Figure 2 were widespread in the areas observed; there are significant areas of bare soil, disturbed soil, soil spoil piles, and soil from OPWL line excavations. The spoil piles from the OPWL we investigated had an RWP warning sign indicating possible actinide contamination. All of these sites are subject to significant erosion and potential for contamination mobility.

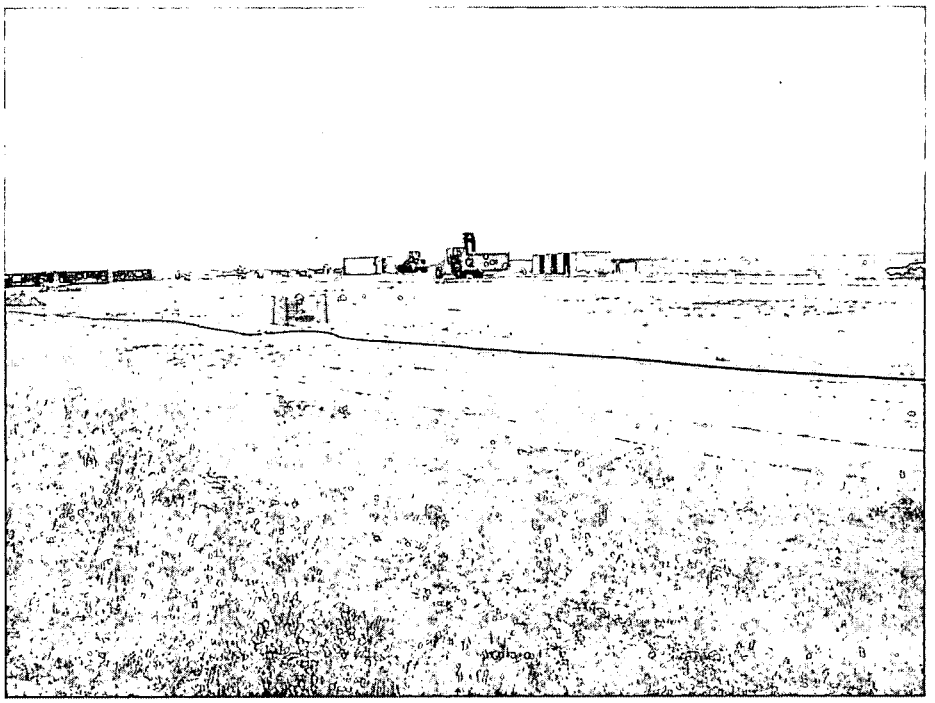

Figure 1a. 903 pad lip remediation site, looking southwest from road.

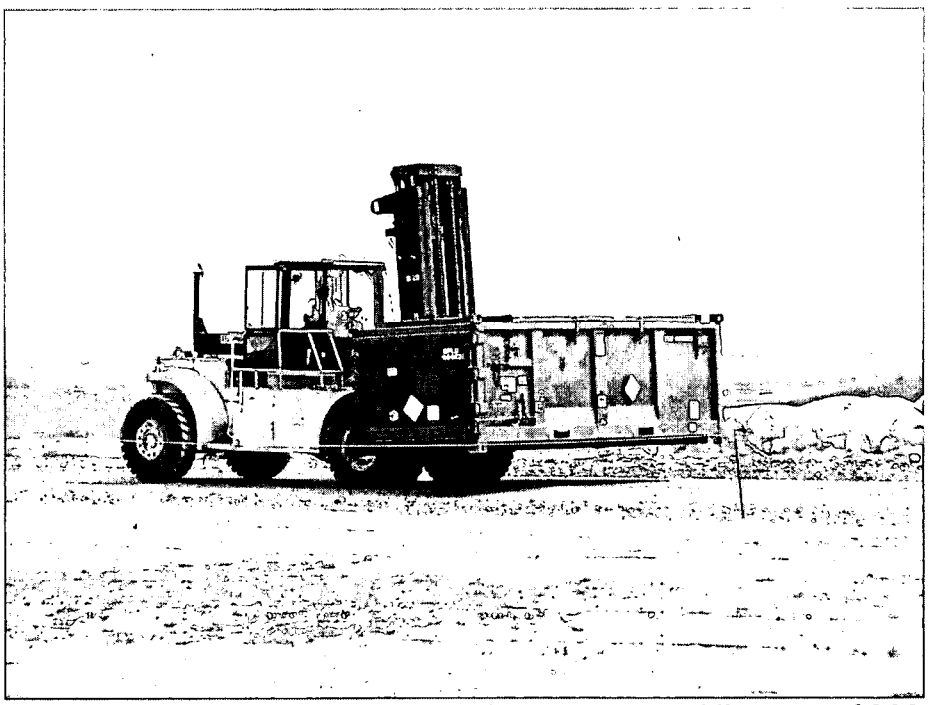

Figure 1b. Closeup view of structured road across treated lip area of 903 Pad, including demarcation ropes, basecourse and early growth of plants through erosion protection matting.

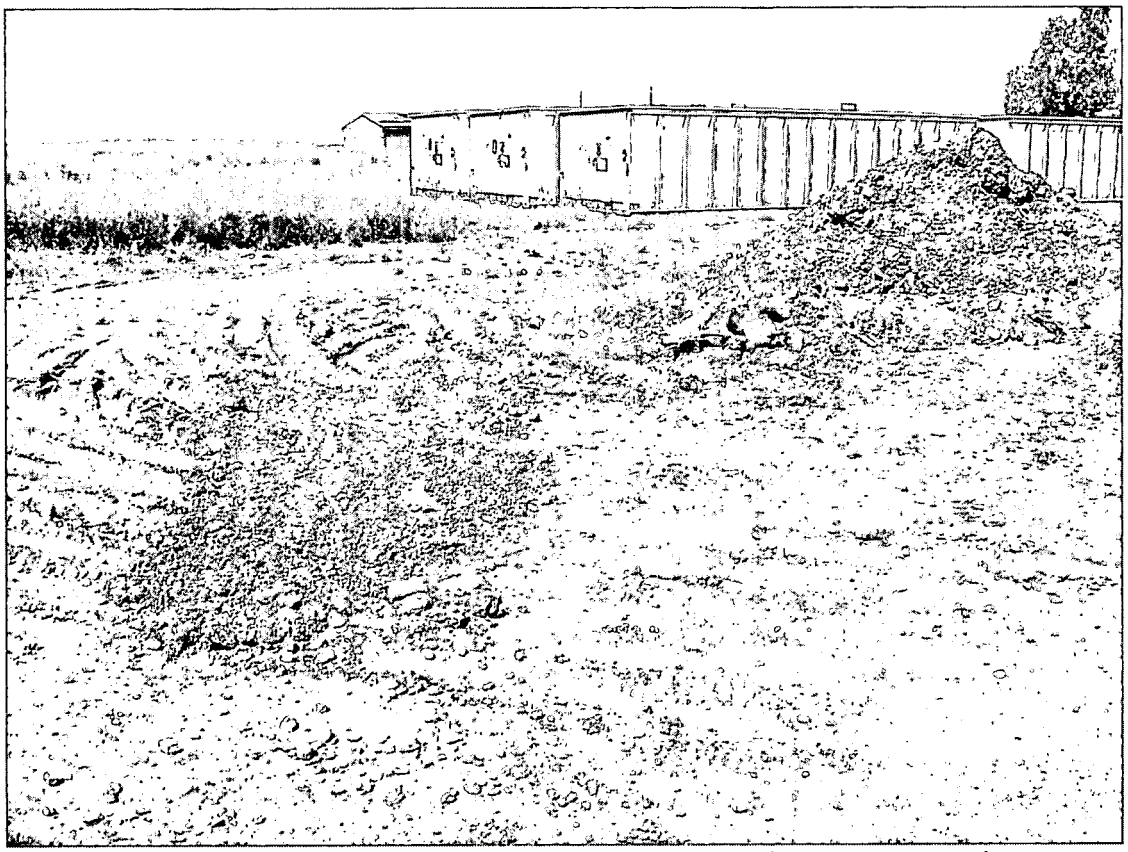

Figure 2. Tire ruts, exposed soil, spoil pile and staged storage containers on remediated area in front (SE) of Solar Ponds area.

900-11 IM/IRA – follow-up/comments

Ian Paton, WWE and AME Group, presented a summary of the 900-11 IM/IRA document. A member of the AME Advisors also reviewed this draft document. The document was found to be comprehensive, technically sound, and a good example or model for IM/IRA documents. The IM/IRA integrated data, decision theory, simulation modeling, geospatial statistically analyses, engineering/economic analyses, and interpretations to provide specific guidance in selection of remediation alternatives and their rational for reducing soil erosion and protecting surface water quality.

Uranium white paper

Ian Paton reported on development of a white paper on uranium contamination at Rocky Flats. This is an important document for near-term decisions and actions at the Site. It builds substantially on uranium sections of the AME Pathway Analysis Report and work by CDPHE, particularly

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understanding of environmental processes and mobility of natural and anthropogenic uranium. Integrated evaluation of buildings, process lines, and waste sites provides the context for evaluation of contaminant concentrations analyzed in surface water and alluvial surface waters of the Site. Multiple studies, including site monitoring utilizing radioactive counting analyses, thermal ionization mass spectrometry, and high-resolution ICP/MS, are presented and discussed in terms of implications for Site closure. The advisors identified a few items that require checking before with the analysts before release of the document. Overall, the maps, plots, and discussion will be a very important reference for D&D, remediation, and closure actions.

Building air monitoring

This was a brief presentation of the results of air monitoring at different distances from D&D activities at building 774 (an old processing facility). The gross alpha counts recorded in the immediate vicinity (3 counting stations) of 774 and at a distance of approximately 0.25 miles (2 stations). A high gross alpha count (ca. 0.23 pCi/m3) was recorded on April 26 & 27, 2004, in the adjacent stations but no in the distant ones.

This signal was also analyzed by pulse height analysis and found to be more likely due to uranium decay and not to Pu(239+240) or Am(241) decay. The interpretation offered was that the activity was due to uranium that was released from the soil around 774 by the D&D activity on the site. The suspended particles apparently fell back to earth within the ¼ mile distance to the second set of alpha counters.

This was an interesting discussion on the nature and quantity of aerial monitoring around sites undergoing D&D

Coordination of Site Activities to Protect Air and Surface Water Standards

There are significant differences in management practices across the Site when dealing with radioactive contamination that represent a vulnerability for the Site with respect to meeting the ultimate air and surface water compliance standards.

As an example of a good management practice, the AME advisors were impressed with the outstanding progress on the remediation of the 903 Pad and Lip area. This project employed a combination of tents, comprehensive erosion control measures, and general environmental protection during cleanup activities. An outstanding IM/IRA document provided a comprehensive plan, and scientific basis for selection of state-of-the-art engineering erosion control that was spatially close to the source and temporally close to the disturbance. The monitoring stations have shown little change in actinide migration as a result of

these activities. This project really demonstrates that the tools and experience are available to help meet air and surface water quality standards.

In contrast, it appears that similar comprehensive plans and practices could or should be employed more uniformly across the Site. During a Site tour, we observed locations with unprotected bare soil and soil piles – some with known or suspected soil concentrations of Pu. This situation represents a significant vulnerability with the potential to cause exceedence of the 0.15 pCi/L surface water standard through wind or water erosion (see figures 1 and 2 above).

We surmise that these differences arise from differences in radioactive cleanup levels. The nanocurie/gram level is the appropriate target for inside building contamination radioactive cleanup, whereas surface soil cleanup levels target picocurie/gram levels in order to reach the ultimate compliance levels of 0.15 pCi/g for surface water and 10 millirem annual exposures from air contamination transport.

These observations lead us to respectfully suggest that D&D and ER activities need to be better coordinated at the highest levels by Site management. This is necessary to make sure that the interfaces between D&D, Remediation and Environmental protection do not lead to exposure of unprotected contaminated soils at levels that that could result in exceeding one of these standards. Every employee working on Site needs to understand how their individual actions can impact the ability of the Site to meet the compliance standards. This could be accomplished by a slight modification of the ISM concept to an Integrated Safety and Environmental Management (ISEM) concept. As part of defining work, and analyzing hazards, workers should also analyze the impacts of their actions on erosion and sediment transport. All workers should be aware of the need to minimize loose piles of dirt, driving over (re-)vegetated areas, etc.

One potential mechanism to deliver this message to all employees would be to use an "all hands meeting", "safety pause", "plan of the day", or some similar means to educate and inform all workers of the importance of the standard, and methods of protecting disturbed soils to guard against erosion. In addition, the management walk-around process could incorporate these similar concepts to be on the lookout for disturbance or unprotected soils.

The D&D cleanup activities deal with relatively high levels of radioactive contamination in buildings where treatment of U and Pu for weapons use were conducted. After completion of these D&D activities, the goal is residual contamination of ≤ 2 nanocuries per 100 cm^2 for free release, although some areas will have higher contamination due to present inability to clean further. By contrast, soil clean up targets are 50 pCi/g and a regulatory limit of 0.15 pCi/L is established for surface water compliance on the site.

This is a significant difference and indicates that management should work to have proper coordination between the D&D activities and those of the environmental remediation work. This requires coordination and information

sharing between these activities at the highest levels by Site management. This goal would be to have the D&D, Remediation and Environmental Monitoring staffs coordinate their activities to reduce transport from contaminated sites and soils to levels not exceeding the 0.15 pCi/L water standard.

Documents Provided to Advisory Group

Agenda
Rocky Flats Envision, v10, n8, May 28, 2004 – B881 readies for demolition & new process reduces waste in Pu building D&D
Building 444 Basement, Depleted Uranium & residual contamination – Ian Paton
Pond Operation Protocols and diagrams
900-11 IM/IRA document
Uranium white paper bullets, ICP/MS graphic & maps

Documents and Information Requested for Advisory Group

Ponds RSOP draft
Monitoring updates as available
Documentation on influence on operations approach and conduct of ops
Documentation on 444 building decisions and experience, path taken
Documentation on 771 building decisions and experience, air/water quality monitoring results

Requests for Future Presentations and Information

Monitoring update and exceedances, public response
Influence on operations approach and conduct of ops
444 building decisions and experience
771 building decisions and experience, air/water quality monitoring results
Closure monitoring plan progress
Tour with Ian & George Squibb again (+Dayton+Shelton)
Continue updates on pond closure strategy

Participants in AMS technical meetings

Name	Organization
Chris Dayton	Kaiser-Hill
Greg Choppin	Florida State
David Clark	Los Alamos
David Janecky	Los Alamos National Laboratory
Leonard Lane	Tucson
John Stover	DOE/RFPO
Ian Paton	Wright Water Engineers
Robert Nininger	Kaiser-Hill
Frank Gibbs	Kaiser-Hill
Chris Gilbreath	Kaiser-Hill
David Shelton	Kaiser-Hill

Future Meetings

October 4-6, 2004